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10/582,930	06/13/2006	Reinhold Meier	4953/PCT	8153
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EXAMINER				
WIEHE, NATHANIEL EDWARD				
ART UNIT		PAPER NUMBER		
3745				
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10/20/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/582,930

**Applicant(s)**

MEIER ET AL.

**Examiner**

NATHANIEL WIEHE

**Art Unit**

3745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 August 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 17-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 17 and 19-33 is/are rejected.
- 7) ☒ Claim(s) 18 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3 August 2009 has been entered.

### ***Response to Arguments***

Applicant's arguments filed 3 August 2009 have been fully considered but they are not persuasive.

Regarding the product-by-process limitation, applicant purports that an open-pored metal foam produced by foaming expansion of the melted metal powder produces "features (e.g. shape, size, open porosity, ect.) that result from and are characteristic of such" a process. While these assertions may very well be true, applicants rebuttal statements do not constitute an *evidentiary* showing of such a difference. Under the burden shifting frame work of product-by-process limitations, put forth in *In re Marosi*, 710 F.2d 79802, 218 USPQ 289, 292 (Fed. Cir. 1983), applicant bears the burden of "com[ing] forward with evidence establishing an unobvious difference". Purporting that differences can be "determined by inspection of the inventive metal foam in comparison to a simple sintered metal" without further showings does not pass this hurdle. The premise behind the burden shifting framework is that "the Patent Office is not equipped

to manufacture products by the myriad of process put before it and then obtain prior art products and make physical comparisons therewith." *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972). The Office, through the Examiner, simply cannot perform the inspection upon which applicant's argument relies. Further, applicant points to what appear to be tailor-able characteristics of the open pores, i.e. shape, size and porosity, which one would assume to be design characteristics and not attributable solely to the process of forming the open-pored metal foam.

Regarding "surficially", applicant persuasively argues that Halila et al. does not include a metal foam component that is *continuously* supported along its back surface. However, the independent claims do not include a "continuous" limitation. Rather, the independent claims require the component to be "rigidly connected *surficially* along the back surface onto the carrier surface of the carrier". The term "surficially" does not impute the continuous limitations argued by applicant since (1) "surficially" does not have an accepted, definite meaning, i.e. the examiner could not find the term in any dictionary, (2) the specification never uses the term "surficially" and thereby cannot supply it with a definition, and (3) the prior use of the term in the art does not impute such a continuous characteristic. The examiner notes the use of the term in U.S. Pat. No. 5,951,254, "a metallic cover layer is *surficially* applied ... onto at least *a portion or the entirety* of the surface of the blade body"[emphasis added] (Sikorski et al., column 2, lines 40-42). It is clear from such a passage that 'surficially' means only that the something is on the surface and not that the thing is continuous about the entire surface.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 17,22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halila et al. (3,825,364), hereinafter "Halila". Halila discloses a gas turbine engine including rotor blades (16) and an abradable shroud lining (18) arranged circumferentially around the blade tips such that they graze the shroud lining. The shroud lining comprises a carrier (27) and an open-pored abradable material (A,B) having a bare front surface and a back surface that is rigidly surfacially connected to the carrier, in that the connection extends on the back surface of the abradable material. The carrier (27) includes holes (26) allowing gas to pass there through directly into the back surface of the abradable material. Further, the abradable material (A,B) is of an open-pored structure so as to allow said gas to flow there through. Further, such gas flow is radial, relative to the axis of the gas turbine engine, through the abradable shroud lining. The abradable material (A,B) is monolithic in that it is a single unit.

In regard to the claimed "metal foam", Halila's abradable material is described as including appropriate low porosity layer (A) and a higher porosity layer (B) and is preferred formed by sintering, a process commonly used for constructing metal materials. Although such a material would appear to be the same as the claimed metal

foam, Halila sheds no further light on the specific composition of the material (A,B). However, the examiner is taking official notice that it is common practice in the art of turbine air seals to utilize a porous abradable material in the form of metal foam, see for example Bowers, Jr. et al. (3,126,149), Roesler et al. (6,412,541) and Wieghardt (2003/0107181), due to their preferable abrading properties. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the invention of Halila by incorporating a metal foam material as the porous abradable material since such a modification is well known in the art due to metal foam's preferable abrading properties. Further, the limitation "metal foam produced by foaming expansion of a melted metal powder" is being treated as a product by process limitation; that is that the metal foam is made by a process including foaming expansion. As set forth in MPEP 2113, product by process claims are NOT limited to the manipulation of the recited steps, only to the structure implied by the steps. Once a product appearing to be substantially the same or similar product is found, a 35 U.S.C. § 102/103 rejection may be made and the burden is shifted to applicant to show an unobvious difference. See MPEP 2113.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Halila et al. (3,825,364), hereinafter "Halila", as applied to claim 17 above, and further in view of Rossmann et al. (4,536,127), hereinafter "Rossmann". The modified invention of Halila discloses the invention substantially as claimed but is silent as to the means by which the abradable component is attached to the carrier surface of the carrier. Rossmann discloses an abradable shroud lining (1) that is secured to a carrier surface (7) of a

carrier (5) such that blades (4) of the turbomachine can graze the front surface of the abradable shroud lining (1). Further, Rossmann's shroud lining (1) is secured to the carrier surface (7) by utilizing an adhesive, i.e. glue. (Rossmann column 2, lines 25-29). It would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the gas turbine of Halila by utilizing a glue to secure the shroud lining to the carrier element as taught by Rossmann since such a combination of prior art elements would yield the predictable results of securing the shroud lining to the carrier element. See MPEP 2143 (A).

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Halila et al. (3,825,364), hereinafter "Halila", as applied to claim 17 above, and further in view of Roesler et al. (6,412,541). Halila disclose the invention substantially as claimed but is silent as to the specific method used to secure the abradable shroud lining to the carrier surface of the carrier. However, Roesler discloses a metal foam abradable coating/cooling structure (7) that is secured to a supporting element by soldering or welding. It would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the gas turbine of Halila by utilizing a solder to secure the shroud lining to the carrier element as taught by Roesler since such a combination of prior art elements would yield the predictable results of securing the shroud lining to the carrier element. See MPEP 2143 (A).

Claims 21 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halila et al. (3,825,364), hereinafter "Halila", as applied to claim 17 above, and further in view of Halliwell et al. (6,062,813), hereinafter "Halliwell". Halila discloses the

invention substantially as claimed except for the use of seal fins on the radially outer blade tips or an abradable material having a stepped contour. Halliwell discloses an abradable shroud lining of a gas turbine engine including an abradable material (28) having a stepped contour that is grazed by seal fins (44) extending radially from the tip (11) of rotating blades (7b). Halliwell's sealing arrangement allows for close clearances and provides an effective seal with reduced gas leakage over the blade tips. (Halliwell column 5, lines 9-13). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Halila by utilizing a seal arrangement having seal fins extending radially from the blade tips and a stepped contour abradable material as taught by Halliwell for the purpose of producing close clearances and an effective seal with reduced gas leakage over the blade tips.

Claims 25 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halila et al. (3,825,364), hereinafter "Halila", as applied to claim 17 above, and further in view of Simon (6,827,556). The modified invention of Halila discloses the invention substantially as claimed except for the specific material of the metal foam material. Simon discloses various metal foam materials used to form gas turbine components. Specifically, Simon notes that nickel-based and cobalt-based metal foam alloys are particularly applicable due to their high temperature resistance. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the turbine of Halila by utilizing a metal foam composed of a nickel alloy or a cobalt alloy as taught by Simon since such materials are particularly



advantageous in the environment of gas turbines due to their resistance to high temperatures.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Halila et al. (3,825,364), hereinafter "Halila", as applied to claim 17 above, and further in view of Bowers et al. (3,126,149), hereinafter "Bowers". The modified invention of Halila discloses the invention substantially as claimed except for the specific material of the metal foam material. Bowers discloses a turbine abradable lining (13) including a foamed material (16) of a mixture of aluminum and sodium silicate, i.e. an aluminum alloy. Further, Bowers' lining material provides desirable abrasability while exhibiting favorable temperature resistance. (Bowers column 1, lines 63-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the turbine of Halila by utilizing a metal foam material comprising an aluminum alloy as taught by Bowers for the purpose of providing an abradable lining having desirable abrasability and favorable temperature resistance.

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Halila et al. (3,825,364), hereinafter "Halila", as applied to claim 17 above, and further in view of Sara (4,155,755). The modified invention of Halila discloses the invention substantially as claimed except for the specific material of the metal foam material. Sara discloses materials for use in porous abradable seal members, particularly of turbine engines, and notes the advantageous use of intermetallic titanium-aluminum alloys due to its heightened oxidation resistance. (Sara column 1, lines 49-58; column 3, lines 10-17). Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to further modify the turbine of Halila by utilizing a metal foam comprising an intermetallic titanium-aluminum alloy for the purpose of providing a metal foam with heightened oxidation resistance.

Claims 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Halila et al. (3,825,364), hereinafter "Halila", in view of Simon (6,827,556). Halila, as described above, provides an abradable shroud lining (A,B) consisting of metal foam for a gas turbine engine that is surfacially attached to a carrier (27), which includes gas passage holes (26) allowing gas to communicate through the holes (26) directly into the abradable component (A,B). However, the modified invention of Halila is silent as to the method used to form the metal foam component. Simon discloses a method of forming metal foam components for use in turbomachines including the steps of (a) mixing together a metal powder and a propellant, particularly titanium hydride, to form a mixed powder, (b) compressing, i.e. compacting, the mixed powder to form a semi-finished part, (c) heating the semi-finished part to melt, i.e. fuse, the metal powder and trigger evolution of the gas by the propellant, (d) expanding the semi-finished part by a foaming expansion due to the gas of the propellant to produce an open-pored metal foam. (Simon column 3, line 60-column 4, line 6). Also, the step of cooling the foam metal is inherent to the process of Simon in that there is no post production heat processing step in Simon's method. It would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the invention of Halila by utilizing the process of forming a metal foam component as taught by Simon since such a combination of prior art elements would yield the predictable results of providing a metal

foam material applicable for use in high temperature turbomachines. See MPEP 2143 (A).

Regarding claim 31, the modified invention of Halila discloses the invention substantially as claimed except for the specific material of the metal foam material. Simon specifically notes that nickel-based and cobalt-based metal foam alloys are particularly applicable due to their high temperature resistance. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the turbine of Halila by utilizing a metal foam composed of a nickel alloy as taught by Simon since such materials are particularly advantageous due to their resistance to high temperatures.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Halila et al. (3,825,364), hereinafter "Halila", in view of Simon (6,827,556) as applied to claim 29 above, and further in view of Rossmann et al. (4,536,127), hereinafter "Rossmann". The modified invention of Halila discloses the invention substantially as claimed but is silent as to the means by which the abradable component is attached to the carrier surface of the carrier. Rossmann discloses an abradable shroud lining (1) that is secured to a carrier surface (7) of a carrier (5) such that blades (4) of the turbomachine can graze the front surface of the abradable shroud lining (1). Further, Rossmann's shroud lining (1) is secured to the carrier surface (7) by utilizing an adhesive, i.e. glue. (Rossmann column 2, lines 25-29). It would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the gas turbine of Halila by gluing the shroud lining to the carrier element as taught by Rossmann since such a combination of

prior art elements would yield the predictable results of securing the shroud lining to the carrier element. See MPEP 2143 (A).

Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Halila et al. (3,825,364), hereinafter "Halila", in view of Simon (6,827,556) as applied to claim 29 above, and further in view of Lefebvre et al. (7,108,828). The modified invention of Halila discloses the invention substantially as claimed except for the step of surfacing machining the part prior to providing the part as the metal foam component of an abradable shroud lining. However, Lefebvre discloses a method of forming porous, foamed materials like that of Simon. Further, Lefebvre provides of the step of machining the material after foaming, clearly so that the final product is of proper dimensions. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the invention of Halila by including the method step of machining the metal foam component after expansion as taught by Lefebvre so that the component is of appropriate dimensions.

***Allowable Subject Matter***

Claim 18 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

The instant invention is deemed to be a non-obvious improvement over the invention of U.S. Pat. No. 3,825,364. The improvement comprises a metal foam

component having a back surface surfacially connected to the carrier surface of a carrier wherein the entire back surface and the entire carrier surface extend continuously along respective straight axis-parallel lines on respective cylindrical contours in combination with the other claim limitations. Such an arrangement of a metal foam component on a carrier element that includes gas passage openings is not known in the prior art.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHANIEL WIEHE whose telephone number is (571)272-8648. The examiner can normally be reached on Mon.-Thur. and alternate Fri., 7am-4:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Look can be reached on (571)272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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